A Field Guide to the Reptiles and Amphibians of the U. S. Naval Security Group Activity Sabana Seca, Puerto Rico

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Introduction

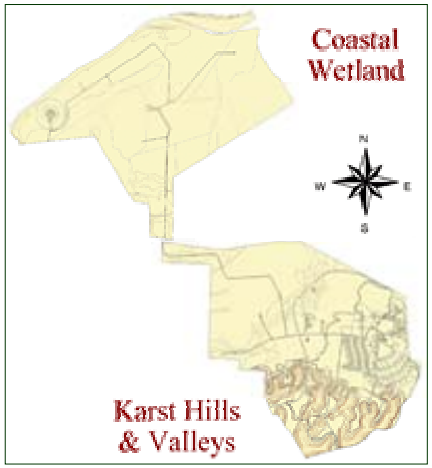
Puerto Rico has a high diversity of amphibians and reptiles. The native herpetofauna of Puerto Rico includes 10 families of amphibians and reptiles. Some of the more conspicuous species include: freshwater turtle, boa, green anole, common coquí, crested toad, and blind snake. Due to the low diversity of large vertebrates in Puerto Rico, many amphibians and reptiles occur at very high densities and, thus, are an important component of the animal community. For example, the densities of lizards and frogs in the Luquillo forest are 10 times greater than densities in the tropical forests of Central America.

Although the herpetofauna plays a very important role in the ecology of the different ecosystems in Puerto Rico, the majority of studies have focused on individual species and most studies have been located in the Luquillo Mountains. Furthermore, given the increasing number of studies that have demonstrated an increase in global and local extinctions, and declining populations of amphibians and reptiles, it is critical that we thoroughly document the distribution and abundance of this ecological important group. There is increasing evidence that global climate change, habitat loss, and the introduction of

exotic species are some of the major factors related with the increase in extinctions and declining populations.

The U. S. Naval Security Group Activity Sabana Seca (NSGASS) is a 2,252-acre facility (911.4 hectares) located on the northern coastal plain near Toa Baja, Puerto Rico.

This facility is divided into two main areas, the North Tract and South Tract, which include several different habitats. Habitats in the North Tract include: herbaceous wetlands, *Pterocarpus* forest, mangroves, canals, and a small coastal river. Habitats in the South Tract include: limestone or karst hills, locally known as 'mogotes', karst valleys, and herbaceous wetlands. Many plants and animals, including some rare or endangered species, depend on these habitats.

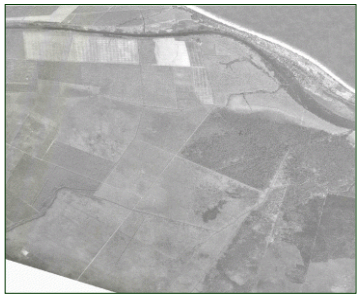


As part of the commitment to the conservation of natural resources, the NSGASS has sponsored many research projects. In this project, we document the amphibian and reptile community in six major habitat types.

Land Use History

From 1511 to 1935 the main land use in Sabana Seca was agriculture. Initially sugarcane was the principal crop, but by 1776 other crops, such as, coffee, cocoa, citrus, and pineapples were cultivated in the region. One of the largest fruit 'haciendas' in Sabana Seca was the Burt E. Stevenson plantation, which was located in what today is the North Tract and most of the South Tract of the NSGASS. This plantation operated from 1910 to 1935, and produced pineapples, oranges, and grapefruits, primarily for export to New York. An additional 220 acres (89 hectares) of the south tract were part of the farm 'Central Juanita', which also produced similar crops. By the late 1930's, the importance of agriculture declines due to a shift in the local Puerto Rican economy toward small industry.

In 1941, the NAVY acquired these properties and started a series of constructions and modifications of the land. From 1943 to 1951, the NAVY converted areas of abandoned agricultural lands into military facilities, communication installations, and a residential district. Smaller areas, including abandoned valleys, were either left to reforest naturally or maintained as lawns. In 1962, the NSGASS became the tenant organization, and, in 1971, they assumed the responsibility of protecting the natural resources.



< 1937

North Tract

1995 >

In the North Tract (1937) sugar cane plantations dominated this area until the late 1930's. Originally this area was covered with wetland forest, most likely dominated by *Pterocarpus officinalis*. This area was deforested and canals were constructed to drain the area for planting. After sugar cane activities were abandoned, these areas have converted to grassland and herbaceous wetlands, and the forest has only recovered along canals (1995).

< 1937

South Tract

1995 >

Agricultural activities, even within the narrow valleys, are evident in the 1937 photograph of the South Tract. Karst hills were not used for agriculture due to the severe topography and poor soils, but they were deforested for timber and firewood. In contrast, karst valleys were used for cultivation. Soil and nutrients from the surround hills were washed downhill by rainfall and deposited in these valleys. This results in fertile soils appropriate for agriculture. In the 1995 photograph, the land use of the same area has changed dramatically. Homes have replaced the cultivated areas, and vegetation has recovered on the karst hills and valleys. Although urban areas have increased between 1937 and 1995, the area covered by forest has also increased.

Habitats

Although the area of the NSGASS is relatively small, it has a high diversity of habitats, and each habitat supports a different community of amphibians and reptiles, resulting in a high diversity of species. The North Tract is mainly coastal wetland, and the most important habitats are: herbaceous wetlands, *Pterocarpus officinalis* forest, mangroves, and the Rio Cocal. The most notable habitats in the South Tract are the limestone (karst) hills and valleys. Within each habitat, transects were established to characterize the vegetation and herpetofauna diversity.

North Tract

Herbaceous Wetlands – Approximately two third of the North Tract is herbaceous wetlands. There are two major types of herbaceous wetlands: areas that are drier and are used for cattle ranching and wetter areas that are dominated by *Typha domingensis* (cattail). This habitat is dominated by amphibians because of the abundance of freshwater. The most abundant amphibians are *Scinax ruber* (no common name), the coquíes, and the white-lipped frog *Leptodactylus albilabris*. The most abundant reptile is *Anolis pulchellus* (grassland anole). Other species that have been frequently observed in this habitat include *Bufo marinus* (marine cane toad), *Rana grylio* (pig frog), and *Trachemys s. stejnegeri* (fresh water turtle or 'jicotea').

Pterocarpus officinalis Forest – The common name of *Pterocarpus officinalis* Jacq. is blood wood, because it has red sap. In Puerto Rico, this species is known at 'Palo de pollo' or chicken tree, because the shape of its buttresses resembles the foot of a chicken. Even though this species is not in danger of extinction, the forest type is threatened by agricultural and urban development. In general, this forest occurs along lowland rivers, behind mangroves in less saline areas (like the one in the North Tract), and in small flooded valleys in upland areas. It is a vital component of fresh to brackish water wetlands throughout the Caribbean, Central and northern South America, and in western Africa. The forest retains nutrients and sediments eroded by rain from upland areas, and protects coral reefs and other marine habitats from excessive sedimentation. In this forest, we have observed three species of reptiles (*Anolis cristatellus* [crested anole], *A. pulchellus*, and *A. stratulus* [spotted anole]) and four species of amphibians (*E. coqui* [common coquí], *L. albilabris*, *R. grylio*, and *B. marinus*).

Mangrove Forest – The white mangrove, *Laguncularia racemosa* (L.) is the dominant species in the study site. However, a few individuals of the black mangrove, *Avicenia germinans* (L.) occur in the forest. This forest remains flooded during most of the year, and soil and water salinity are higher than in the *Pterocarpus officinalis* Forest. The lack of freshwater and little or no understory vegetation, might explain the low herpetofauna species richness. Two anole species, *Anolis cristatellus* and *A. stratulus*, are the only residents. The marine cane toad, *Bufo marinus*, can be seen occasionally on the forest floor, especially during the dryer months.

Rio Cocal – The Rio Cocal is the largest body of water within the area, and extends eastward along the north coast. It is surrounded by red mangrove, *Rhizophora mangle* (L.). Red mangrove also occurs along the banks of several small canals, which flow into the Rio Cocal. Four species of reptiles have been observed in this habitat. The lizards *Anolis cristatellus* and *A. stratulus*, and the introduced green iguana, *Iguana iguana*, are permanent residents. The 'jicotea', *Trachemys s. stejnegeri*, occasionally has been observed basking on drifting logs.

South Tract

Karst Hills – Millions of years ago, these karst hills formed in a marine environment by deposition, fusion, and solidification of high calcium carbonate materials. When these areas became exposed, approximately 35 million years ago, the combined effect of water, wind, and solar radiation began to reshape these hills. The weathering of the limestone rocks and the deposition of soil have produced two distinct microhabitats: hilltops and hillsides.

The hilltops are characterized by large areas of exposed rock and pockets of brownish loose soil in crevices and fissures. The scarcity of soil and rapid water percolation results in trees of small diameter and stature. Erosion by wind and water moves nutrients and soil from the hilltops to the hillsides and valleys. The karst hillsides are characterized by dense reddish soils, rich in clay and debris, resulting in trees of larger diameter and stature.

The species that have been frequently observed in the karst hills include *Anolis cristatellus*, *A. stratulus*, *A. cuvieri* (giant anole), *Ameiva exsul* ('siguana', not a true iguana), *Epicrates inornatus* (boa), *Alsophis portoricensis* (racer snake), *Arrhyton exiguum* (garden snake), *E. coqui*, *E. cochranae* (whistling coquí), and *E. antillensis* (Antillean coquí).

Karst Valleys – The karst valleys are more humid and have richer soils in comparison with the karst hills. For these reasons, they were deforested for agricultural activities. Many agricultural areas have been abandoned, and reforestation has occurred naturally or has changed to other uses.

V1

In this study, we compared the herpetofauna diversity among three karst valleys. One valley has been maintained with cut grass (V1). A second valley (V2) was maintained with cut grass until 2000, when it was reforested with more than 500 individuals of native trees. A third valley (V3) was abandoned approximately 40 years ago, and has recovered naturally.

V2

V3

The species that have been observed in the karst valleys include *Anolis pulchellus*, *A. cristatellus*, *A. stratulus*, *A. cuvieri*, *A. krugi*, *Ameiva exsul*, *E. inornatus*, *A. portoricensis*, *A. exiguum*, *E. coqui*, *E. cochranae*, *E. antillensis*, *B. marinus*, and *L. albilabris*.

Species

Lizards

Snakes

Amphibians

Turtle

Ameiva exsul

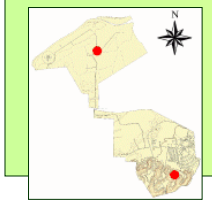
Natural History and Ecology – This is the larger of the two 'siguanas' or ground lizards from the main island of Puerto Rico.

It is also the most abundant and widespread 'siguana'. Individuals of this species can often be heard foraging in the litter, which makes it easy to spot and identify. When disturbed, they do not climb trees, but run quickly for a short distance and then continue foraging. It is a diurnal active forager and has a diet which includes insect larvae and adults, small amphibians (e.g. *Eleutherodactylus antillensis*), eggs, and fruits.

Size and Coloration – Adults grow up to 7.9" (20 cm) in snout-vent length. They are brown or olive-brown dorsally, with scattered cream-white spots on the flanks and hind legs. Some males exhibit a dull bluish tan on the head and flanks, and this coloration pattern can extend to the tail.

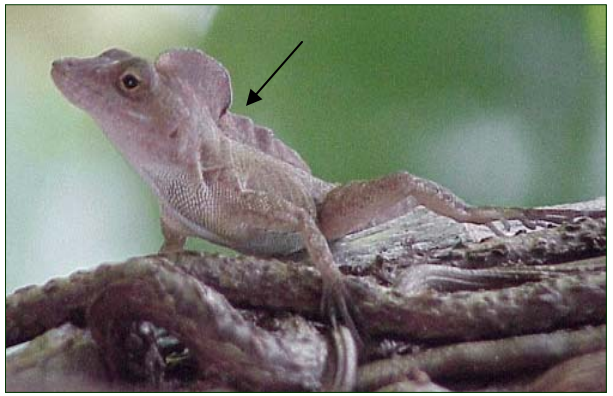
Similar species – Although a second 'siguana' (*Ameiva wetmorei*) also exists on the main island of Puerto Rico, it is 1/2 to 1/3 the size of *A. exsul*. In addition, *A. wetmorei* has several longitudinal mid- and dorso-lateral cream stripes on a black background, a bright scarlet colored tail, and a distribution limited to the driest areas in southern and southwestern Puerto Rico.

Distribution – *Ameiva exsul* is limited to the forest floor. It prefers areas with dry soils in the karst region. It was most frequently found foraging in closed canopy forest and forest margins. When basking (e.g. sunbathing) it was found most frequently along margins of trails and roads.



Anolis cristatellus

Natural History and Ecology – This is the common anole or 'lagartijo común' of Puerto Rico. It is also known as the Puerto Rican crested anole, because many males have a conspicuous crest and tail fin. The species has an extensive distribution, and although it is most abundant in forested areas, it is also common in urban habitats. Introduced populations exist in southeastern Dominican Republic and south Florida. It is diurnal and mainly arboreal. Juveniles and adults sleep on twigs and leaves of shrubs and trees, but juveniles usually occur closer to the ground. Its' diet includes invertebrates, amphibians, and other anoles.



The large dorsal crest gives the species its common name, the crested anole.

Size and Coloration – Adults grow to 3.0" (7.5 cm) in snout-vent length. The species is mainly brown or grayish brown although it can occur in many shades of brown, turning darker or lighter when basking under the sun. Some specimens have a

mid-dorsal cream band with a darker brown margin. The dewlap is light cream to orange-cream turning to light orange toward the margins.

Female in sleeping posture on a leaf.

Male expanding its dewlap (e.g., throat fan).

Similar species – *Anolis gundlachi* is the most similar species, but it occurs exclusively in densely forested highlands, and does not occur in the lowlands. *Anolis gundlachi* is similar in size, but has blue eyelids, a characteristic not present in *A. cristatellus*.

Male and female copulating.

Distribution – The species occurs in all forested areas in Sabana Seca, including mangrove and *Pterocarpus officinalis* forests, karst hills, and forested karst valleys. It can also be observed in trees and shrubs along the margins of roads and on fence posts. In pastures and herbaceous wetlands, it has only been observed near forested areas or on trees close to roads.

Anolis cuvieri

Natural History and Ecology – This is the largest native lizard and only giant anole in Puerto Rico. It lives in closed canopy forest, and is frequently found in coffee plantations in the central mountain range. It also occurs at lower elevations in the karst region where it can be quite abundant. Individuals move very slow and spend much of the time on the same tree trunk or branch. Due to the green coloration it blends in with the vegetation. Individuals of *Anolis cuvieri* move slowly when searching for prey, but once they are within a meter they lung and attach the prey. Its prey includes other anoles, small birds, and invertebrates.

Male, old adult.

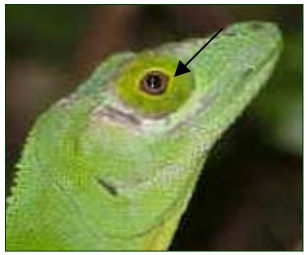
Young adult.

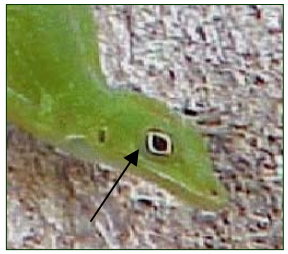
Recently hatched juvenile in sleeping posture.

Size and Coloration – Adults grow to 5.0” (12.5 cm) in snout-vent length. They are generally green, and no brown adults have

been observed in the study area. Adults have a yellow eyelid. Recently hatched juveniles (approx. 1.5" [4.0 cm] in snout-vent length) are cream with brown blotches and bands along the body.

Similar species – Although a second green anole (*Anolis evermanni*) also exists in the same forests, it is much smaller (about 1/2 of the size of *A. cuvieri*) and has a white eyelid.





Anolis evermanni

Recently hatched juvenile of *Anolis cuvieri*.

Distribution – *Anolis cuvieri* is limited to the closed canopy forest in the karst region. During the day, adults are frequently found on tree trunks from about 3.3' (1.0 m) above ground to the canopy level. Juveniles are usually found at lower heights. Individuals of all sizes have been observed at night sleeping on branches and small twigs along the forest margins.

Anolis evermanni

Natural History and Ecology – This is the Puerto Rican green anole. It is a common inhabitant of closed canopy forest throughout the central mountain range, but is also frequently found at lower elevations. *Anolis evermanni* prefers large perches and trunks, including the thick stems of bamboo and palms. It is active during the day.

Adult female.

Size and Coloration – Large males grow to 2.4" (6.0 cm) in snout-vent length. Adults are green, but when exited they change to a brownish-green or to a very dark brown phase. Juveniles are gray, but the head is usually greenish. All individuals have a white eyelid.

Similar species – *Anolis evermanni* is closely related to *A. stratulus*. The two species are similar in size, but *A. evermanni* can be distinguished easily by its green coloration (*A. stratulus* has a mottled gray coloration pattern). The other green anole (*A. cuvieri*) is two times larger and has a yellow eyelid.

Anolis evermanni, juvenile.

Distribution – *Anolis evermanni* is limited to the lower slopes of

the closed canopy forest in the karst region. During the day, adults are frequently found on medium to large tree trunks at heights > 6.6' (2.0 m). Juveniles are frequently found at lower heights. The species is more frequently found on the green stems of bamboo in the forested valleys.

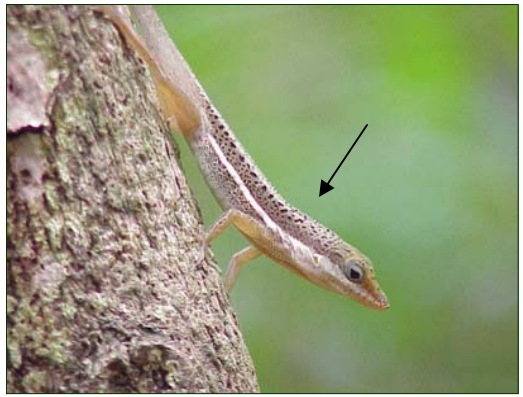
The same adult male of *A. evermanni* showing different color phases.

Anolis krugi

Natural History and Ecology – This species is called the mountain garden lizard or 'lagartijo jardinero de montaña'. At higher elevations, the species occurs in open and altered habitats (e.g., roads sides) on small bushes, vines, and ground level vegetation. At lower elevations (e.g., 82.5' [25 meters] above sea level), it occurs in more shady and forested habitats. It is diurnal.

Adult male.

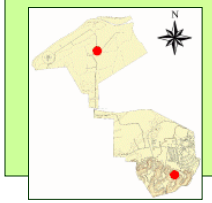
Size and Coloration – Adult males grow to approximately 2.0" (5.0 cm) in snout-vent length. Individuals of *A. krugi* have numerous black blotches on the head and along the back. Males have an orange-yellow dewlap. Some individuals show minute pale iridescent scarlet spots on the back of the head.



Adult female.

Similar species – *Anolis krugi* is very similar to *Anolis pulchellus* (inserted picture), but *A. krugi* can be distinguished by the lack of a dark brown stripe in the back of its eye, by its brownish-orange color of its snout, by its dark dorsal blotches and spots, and by the presence of the small scarlet spots on the back of the head.

Distribution – *Anolis krugi* is frequently observed on shrubs, vines, and grasses in karst valleys with a closed canopy. Adult males have been found on trees up to 10.0' (3.0 m) in height. When disturbed, they usually climb up higher if they are on a tall tree, or if in a small shrub, they dive into the forest floor, run, and climb up a taller tree. Individuals can frequently be found in edges where the forested valleys meet grass valleys, but they do not move far into the grass valley.



Anolis pulchellus

Natural History and Ecology – This is the garden lizard or common grass anole. It is probably the most common *Anolis* of Puerto Rico. It prefers open areas dominated by grasses, but it is very shy and escapes observation by diving quickly into the grass. Population densities can be as high as 8,000 to 10,100 individuals per acre (20,000 to 25,000 per hectare). The species is diurnal.

Adult male showing its dewlap and compressing its body laterally.

Size and Coloration – Adults grow to 2.0" (5.0 cm) in snout-vent length. The coloration patterns are yellowish brown, brownish gray, or light uniform yellow in the back and almost white in the vent. The most conspicuous identification characters are the dark brown stripe behind the eyes (right), and a band that extends along the flank toward the hind leg. In

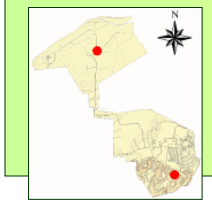
males, the dewlap is bluish pink and blue at the margins toward the throat and red-orange toward the outer edge.

Similar species – Although similar to *Anolis krugi*, differences in coloration patterns and in habitat requirements of *A. pulchellus* make it easy to distinguish one species from the other.

Male displaying an aggressive posture. It takes out its tongue and compresses its body laterally to appear larger and fierce.

Typical resting posture of an adult male.

Distribution – *Anolis pulchellus* is frequently found in grasslands in the South Tract and all pasture and herbaceous wetland areas in the North Tract. It can also be found on fences, and much less frequently in *Pterocarpus officinalis* Forest, usually on ferns and vines within the forest. It has not been observed in closed-canopy karst forests or forested valleys.



Anolis stratulus

Natural History and Ecology – *Anolis stratulus* is known as the 'lagartijo manchado', and it has one of the widest distributions of all the Puerto Rican anoles. This species is the most abundant anole in mid-elevation areas. It is not shy, and an observer can get very close to a male, which will show its dewlap without any hesitation. It is diurnal, and feeds primarily on ants, but other items include insects and mollusks (land snails).

Adult males showing the dewlap.

Size and Coloration – Adults grow to 1.8” (4.5 cm) in snout-vent length. Individuals have a gray background and a series of distinct darker marks on the back of the neck and the back of the body. The dewlap is bright orange and yellow toward the margins. Females can extend a much smaller dewlap (throat fan), which is mostly gray and pale orange toward the throat.

Similar species – There are no similar species, however juveniles of *Anolis stratulus* might be confused with those of *A. evermanni*. For instance, juveniles of *A. stratulus* have the same coloration and pattern design as the adults. Similarly, younger juveniles of *A. evermanni* are grayish and look like juveniles of *A. stratulus*. However, juveniles of these two species can be distinguished by close inspection of the coloration around the head and neck. In juveniles of *A. evermanni* (page 18) this area is greenish gray, while in *A. stratulus* there is uniformly gray.

Distribution – The species is widely distributed in all forested areas from mangrove forests to karst hilltops. Individuals are frequently found on trees from about 6.6' (2 0 m) up to the canopy level, where it seems to be most abundant.

Adult eating a land snail.

Hemidactylus brooki haitianus

Natural History and Ecology – This is the common house gecko. It is nocturnal and it is generally associated with buildings, houses, and other dwellings. Their diet consists of moths and other flying insects that are attracted to artificial lights. Larger preys include cockroaches, smaller geckos, anoles, and frogs (e.g. *Eleutherodactylus* sp.). Although it can be confused with salamanders, which are amphibians, *Hemidactylus* is a reptile.

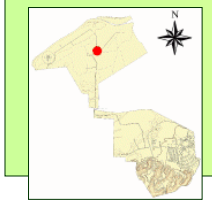
Size and Coloration – Some males grow to 2.5" (6.5 cm) in snout-vent length. Individuals are flattened dorso-ventrally. Adults are either grayish or pinkish cream at night, but during the day when they are inactive the coloration changes to a darker brownish white. The tail has dark bands that can be diffuse in adults, but more conspicuous in juveniles.

Similar species – A second *Hemidactylus* (*H. mabouia*) is present in Puerto Rico. Adults of *Hemidactylus mabouia* are slightly darker, have a better-defined dorsal pattern (a series of V-shaped bands), and have tail bands that are generally better defined than in *H. brooki haitianus*.

Adult.

Distribution – The species has been found on the walls of buildings near the karst hills in the South Tract. Individuals of all sizes have been seen feeding at night around lights on these buildings. No individual has been observed in the forest.

Juvenile with conspicuous tail bands.



Iguana iguana

Natural History and Ecology – Native to Central and South America, the common iguana is now well established in many coastal and some inland areas of Puerto Rico. Individuals of *Iguana iguana* are agile swimmers. They are commonly found on trees and on the ground near bodies of water, such as rivers and creeks. When disturbed, iguanas dive into the water. It is a diurnal species and its' diet consists mainly of leaves. It lays eggs in under ground nests and the reproductive season peaks from November to December.

Adult.

Size and Coloration – Adults can grow from 5.0' to 6.6' (1.5 to 2.0 m) in snout-vent length. They are usually green or grayish green with darker bands on the back and tail. Some individuals have a yellowish orange coloration on the flank.

Similar species – A second iguana from the Lesser Antilles (*Iguana delicatissima*) has been capture in Puerto Rico and it is possible that some specimens that have been identified as *I. iguana* are *I. delicatissima*. These species can be distinguished by the size of the scute immediately below the tympanum. In *I. iguana* this scute is much larger than the surrounding scute. In *I. delicatissima* this scute is similar in size in comparison with the surrounding scutes.

Distribution – The species is frequently found on mangrove trees along the margins of the Rio Cocal. The species has not been observed inside the mangrove forest or in any other habitat.

Juvenile.

Alsophis portoricensis

Natural History and Ecology – This is the second largest Puerto Rican snake. It is terrestrial, although some individuals have been observed on trees at more than 33.0' (10 m) above the ground. The species is diurnal, individuals are active foragers, and their diet consists primarily of anoles, amphibians, and 'siguanas'. Some people are allergic to *Alsophis portoricensis*' saliva, but it is not venomous. Symptoms are usually limited to swelling and bleeding around the bite.

Size and Coloration – Adults grow to 31.5" (80 cm) in snout-vent length. They are brown to olive brown dorsally and whitish ventrally. Recently hatch juveniles can have a yellowish throat, but this coloration pattern is lost with maturity.

Similar species – There are no similar species, but at least five subspecies have been recognized based on variations in coloration patterns and body size.

Distribution – The species is most common in the forested karts hills and valleys. It also has been observed near the forest edges, and under lumber in disturbed areas close to the forest.

Arrhyton exiguum

Natural History and Ecology – This is the third largest Puerto Rican snake. Little is known about its secretive habits. It is a terrestrial species, and in the karst region individuals have been frequently observed foraging late in the afternoon and early evening. Juveniles have been observed coiled around small stems at about 2.0" (5.0 cm) above ground. Its diet includes small anoles and amphibians (e.g. *Eleutherodactylus* sp. and their eggs).

Size and Coloration – Adults grow to 17.5" (45 cm) in snout-vent length. They are light brown dorsally with darker brownish blotches behind the head and with spots regularly arranged along three dorso-longitudinal lines. A darker brownish lateral band extends from its snout along the entire length of the body. The species is white-cream ventrally.

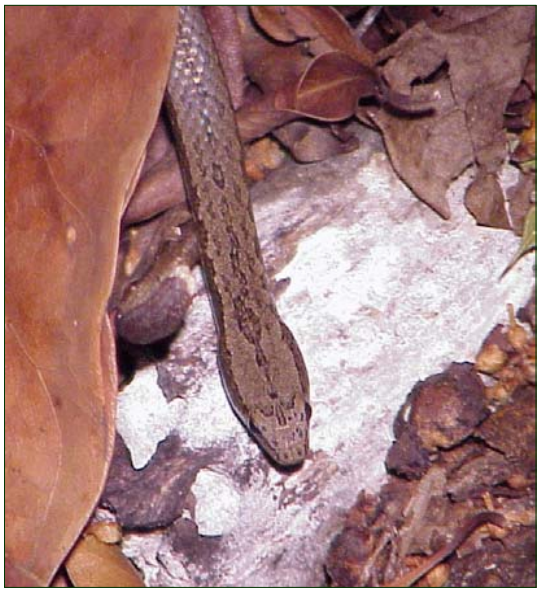
Detail of the lateral stripes in *A. exiguum*.

Detail of the dorsal coloration pattern.

Similar species – No similar species exists although three subspecies have been recognized based on variations in coloration patterns and body sizes. In general, the species can be distinguished from juveniles of the

much larger *Alsophis portoricensis* based on the coloration pattern. Juveniles of *Arrhyton exiguum* retain the coloration pattern of adults while juveniles of *A. portoricensis* are uniformly dark olive-brown dorsally.

Distribution – The species is frequently found foraging in the forest floor around large limestone rocks and trees within forested karst hill and valleys.



Head characteristics of *A. exiguum*.

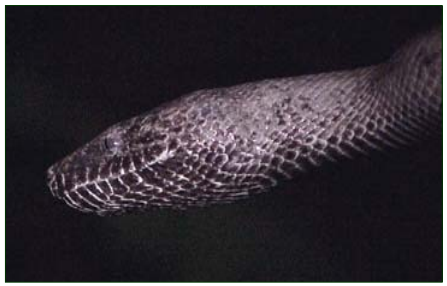
Epicrates inornatus

Natural History and Ecology – This is largest Puerto Rican snake or 'culebrón'. All species in the genus *Epicrates* are protected by the state, federal, and international laws. The species is not venomous, but people often kill this species because it is believed to have special healing property. If left undisturbed they are not dangerous and they will not strike at humans. It is a nocturnal species, and individuals are frequently found on the forest floor, shrubs, vines, and on tree branches. The diet of juveniles consists primarily of small amphibians and reptiles (mainly anoles), while adults feed on large reptiles, birds, and small mammals. Adults often hang on branches and lianas in front of entrances to karst caves, trying to capture bats.

Size and Coloration – Adults grow to 7.6’ (2.3 m) in snout-vent length. Juveniles are light brown dorsally with a series of darker brown blotches along the body, and light uniformly orange-brown

ventrally. As they mature, the dorsal coloration turns dark cream to brown with scattered areas of an iridescent sheen. The ventral coloration turns light cream with distinct dark brown spot scattered along the length of the body. Adults tend to be dark brown, dark gray, or black dorsally with the persistent iridescent sheen and the ventral coloration is dark gray or blackish with no obvious spot pattern.

Sub-adult.



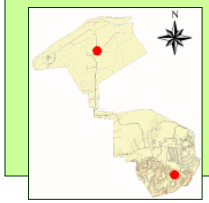
Adult.

Similar species – Although a second *Epicrates* exists in Puerto Rico (*E. monensis*), it is about 1/3 the size of *E. inornatus*. In addition, adults of *E. monensis* have a very distinct dorsal pattern of darker brown blotches on a lighter brownish to grayish cream background. This coloration pattern has not been observed on juveniles of *E. inornatus*.

Juvenile.

Distribution – The species occurs in the karst hills and forested valleys. Juveniles are frequently found on branches of small shrubs along the forest edges, where they are probably hunting sleeping anoles lizards. Adults are frequently found on the forest floor and climbing large shrubs and trees. It is possible that adults also gather at the entrance of caves to feed on bats, but this behavior has not been observed within the study area.

Juvenile found on a *Cecropia* sp., which was planted in the reforested valley.



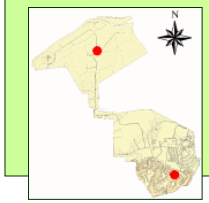
Typhlops platycephalus

Natural History and Ecology – Snakes of the genus *Typhlops* are generally known as blind or worm snakes. They live under ground, which makes it difficult to study their ecology. They feed on eggs, larvae, and adult ants and termites. This species occurs in lowland habitats in Puerto Rico and on Vieques Island. Occasionally, an individual can be seen at night in the leaf litter, but it quickly moving in a side-winding locomotion pattern into the litter or ground.

Size and Coloration – Adults of this species can grow to 12.2" (31 cm) in snout-vent length. They are dark reddish-brown dorsally and the ventral side is whitish. Near the end of the tail there is break in the coloration on the dorsal sides. Although this characteristic is variable between individuals, it is unique to this species.

Similar species – There are four species in the main island of Puerto Rico and two additional species in Mona Island and Culebra Island. The coloration pattern on the tail of *Typhlops platycephalus* distinguishes this species.

Distribution – Individuals of this species have been found under debris and garbage, where ant nests are abundant, and along the margins of the main road in the North Tract. Individuals have also been found in the leaf litter at night in the lower slopes of the karst hills in the South Tract.



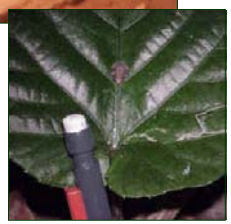
Eleutherodactylus coqui

Natural History and Ecology – There are over 500 species of *Eleutherodactylus* in the world. Sixteen species occur in Puerto Rico, and they are all known locally as 'coquí'. One of the most studied species is the common coquí, *E. coqui*. Males emit a characteristic two-note call, which is the basis of the common name: a low pitch 'co' followed by a high pitch 'quí'. The species is the most abundant Puerto Rican frog. It is mainly arboreal, and inhabits all but the driest habitats at all elevations. It reproduces by terrestrial eggs, and when juveniles emerge they are miniature copies of adults. The common coquí has been introduced into the Dominican Republic, and into Florida and Hawaii in the US.

Adult male calling.

Size and Coloration – Adults grow to 1.4” (3.5 cm) in snout-vent length. The upper half of the eyes is gold colored. Dorsal coloration includes various shades of solid brown and cream with brownish blotches, dots, and bands on the back.

Embryo in egg.



Recently hatched juvenile.

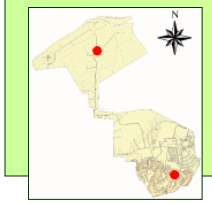
Similar species – The closest relative of *Eleutherodactylus coqui* is *E. portoricensis*, the mountain coquí. It has a similar but faster call, the upper half of the eyes is white colored, and

the species is restricted to the highest elevations in the mountains. In addition, the body size of *E. coqui* increases with lower temperatures at higher elevations resulting in calls of lower frequency, which can easily be distinguished from calls of other species.

The adults lay the eggs in tree holes, in rolled or open leaves, and under the leaf litter in the ground.

Distribution – The species occurs in all habitats, except the mangrove forest. It is most abundant in the *Pterocarpus* forest in the North Tract. In this habitat, the species reproduces under the leaf litter and in large rolled leafs of shrubs where females deposit eggs that are guarded by the male until they hatch. The common coquí also occurs in the karst hilltops down to the forested valleys in the South Tract. Individuals can be found from the forest floor up to the canopy, but general occur in the lower strata of the forest.

Calling male.



Eleutherodactylus cochranae

Natural History and Ecology – This is the whistling coquí or 'coquí pitito', one of the smallest Puerto Rican coquíes. It is most abundant in dry and lowland habitats. The species produces terrestrial eggs. Males call from shrubs, branches of tall trees, leaf axils of bromeliads, and from the leaf axils of large grasses and herbs. The male's call consists of a single, fine prolonged whistle followed by one to three 'clicks'.

Size and Coloration – Adults grow to 0.7" (1.7 cm). The dorsal coloration is grayish light brown and in some individuals, two externally concave, dorso-lateral lines are present. This coloration pattern can be observed in some adults as well as in recently hatched juveniles. Two perpendicular lines divide the eye into four equal sections. This pattern in the eye makes it easy to identify juveniles of *E. cochranae* from those of other coexisting species.

Adult.

Juvenile.

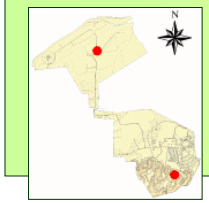
Similar species – Another small Puerto Rican coquí, *E. brittoni*, is common in grass and herb lands at low elevations. This species usually stays near the ground and rarely climbs trees or tall herbs. *Eleutherodactylus brittoni* can also be distinguished from *E. cochranae* by having a dark lateral line that extends from the snout toward the end of its flank.

Eleutherodactylus cochranae, adult.

Distribution – The species is most abundant in the herbaceous wetland dominated cattails (*Typha* sp.), and on trees along the main road in the North Tract. Although not as abundant, it also occurs in the karst hills and forested valleys. It has not been observed in the forested wetlands.

A calling sequence showing: initial inflation of the vocal sac (left), intermediate inflation (center), and maximal inflation where the sac is inflated to the middle of the abdomen (right).

The small size and coloration make hard to observe those individuals that jump into the leaf litter.



Eleutherodactylus antillensis

Natural History and Ecology – This is the 'coquí churí' or 'coquí de las Antillas'. The species has a wide distribution, similar to that of *Eleutherodactylus coqui*. However, it is not as abundant as *E. coqui*. It prefers open, disturbed, grassland areas at low elevations. Individuals of *E. antillensis* are frequently observed at or near the ground. Males emit two characteristic calls. The most common call is a two-note and fast-paced "churí-churí", and a second less frequent call includes a series of 6 to 8 "quí" notes. This species has become the most abundant coquí in urban and disturbed areas.

Male calling.

Size and Coloration – Adults grow to 1.0” (2.5 cm) in snout-vent length. They are light brown dorsally and a fine mid-dorsal line is present in most individuals. Juveniles have orange-red eyes, which change to dark red with maturity.

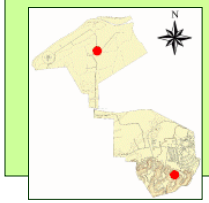
Similar species – Although it can be confused with *Eleutherodactylus coqui*,

differences in eye coloration help to distinguish these species. In addition, *E. antillensis* has a dark line along both sides of the snout that extends above and halfway around the tympanum. This character is rarely present in *E. coqui*.

Male

Distribution – The species if most abundant in non-flooded pastures and along the margins of the main road in the North Tract. It is also frequently observed in the karst hills and forest edges in the South Tract. However, it is much less abundant in dense forested areas than it is in open grasslands and other disturbed areas.

Females.



Leptodactylus albilabris

Natural History and Ecology – This species is the closest relative of all Puerto Rican coquíes. It is called the white-lipped frog or 'sapito de labio blanco'. It is widely distributed and very abundant in humid areas. It is a nocturnal species and adults are terrestrial. Males produce a characteristic call of many "pik-pik-pik" notes. Like coquíes, it lays terrestrial eggs, but they are laid in a foam nest on the ground, usually under a rock or log. Eggs develop into tadpoles, which are washed away by the first rains and finish their development in temporary pools, or bodies of water with low or no water movement. Larvae grow to approximately 1.3 cm in length. The adult diet includes insects, millipedes, land snails, and other frogs (e.g., juveniles of *Eleutherodactylus coqui*).

Adult female.

Size and Coloration – In general, adults grow to 1.4" (3.5 cm) in snout-vent length, but like other Puerto Rican frogs (e.g., *Eleutherodactylus coqui* and *E. antillensis*), the body size increases with elevation. Individuals have a grayish brown background color with dorsal lines and bands of various shades of

Sub-adult.

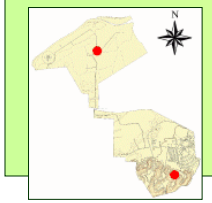
brown, cream, and reddish brown. It is white ventrally, and some males have many dark spots on the throat.

Similar species – There are no similar species, however several species of exotic frogs also use bodies of water for their eggs and larval development. Larvae of *Leptodactylus albilabris* are uniformly brown to brownish-gray at first sight, and measure approximately 0.6" (1.5 cm) from snout to tail tip. Larvae of *L. albilabris* might be confused with those of *Rana grylio* (pig frog), but larvae of *L. albilabris* are two to three times smaller than those of *R. grylio*. The larvae of the other two exotic species, *Scinax ruber* and *Bufo marinus*, can be distinguished from all other frogs by their coloration alone. The photographs below show the different coloration pattern and relative size of the larvae.

L. albilabris, larva.

Distribution – This species has been observed in all habitats except the karst hilltops and mangrove forest. It is particularly abundant in the forested and herbaceous wetlands in the North Tract. Larvae have been observed wherever there is water, including water filled depressions in deforested areas in the South Tract.

Adult male calling.



Bufo marinus

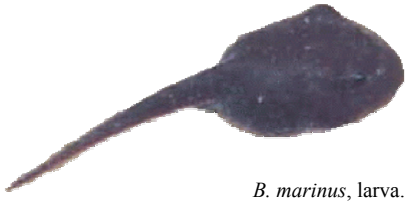
Natural History and Ecology – This species was first introduced to Puerto Rico in 1920. The firsts individuals came from Jamaica and Barbados as an attempt to control a beetle larva that attacks sugar cane. A year latter, the 'common toad' population had dispersed and established throughout the island. Its' diet is very broad including insect to birds, and items such as rice and beans. It has warty tough skin that helps it conserve water, which has facilitated its establishment in dry areas. To attract females, males call from a body of water by vibrating the vocal sac and producing a continuous "BRRRRR…" call. After attracting and mating with a female, a long string of black eggs can be seen in the water. After hatching, hundreds to thousand of larvae can be seen feeding together.

Size and Coloration – Adults grow to 8.3" (21.2 cm) in snout-vent length. Animals are brown to dark brown ventrally and white with brown blotches on its ventral surface. Juveniles can have orange-brown warts, and larvae are solid black.

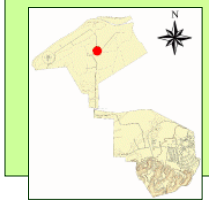
Similar species – The common name of the native *Bufo lemur*, 'sapo concho' or crested toad is often used for the introduced *Bufo marinus*. *Bufo lemur* is very rare and its populations are restricted to the driest areas in the southwestern part of the island. It is half the size of *B. marinus*, has an inward pointed snout, and a protruding crest above each eye. These characteristics make it easy to differentiate the two species.

Larvae can be observed aggregated in shallow, standstill pools.

Distribution – The species is found frequently along paved roads and pastures in the North Tract. It occurs in similar areas in the South Tract, but does not occur in karst hills or in any forested area.



B. marinus, larva.



Rana grylio

Natural History and Ecology – This semi-aquatic frog, native to southeastern US, is known as the pig frog. Its call resembles the guttural grunting of a pig. Males call while floating in water or sitting on floating grasses. Males can be distinguished from females because the tympanum is larger than its eye, while in females the tympanum is usually smaller than the eye. In its native habitat, the pig frog feeds on crayfish. In Puerto Rico, it probably feeds on shrimps, aquatic insects, small fishes, and other frogs. Larvae and metamorphosed juveniles have been observed in the *Pterocarpus officinalis* forest and herbaceous wetlands, which indicates that the species is well established in these areas.

Male.

Female.

Size and Coloration – Adults grow to 6.0” (15.2 cm) in snout-vent length. Individuals from Puerto Rico are brown dorsally with darker blotches scattered across the back (a leopard-like pattern). Females are white ventrally with similar dark blotches. Males have the same ventral pattern and a yellow vocal sac. Pig frog larvae have dorsal dark-brown blotches, which are not observed on any other larvae in Puerto Rico.

Juveniles of *Rana grylio*.

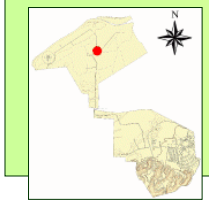
Similar species – *Rana catesbeiana*, the introduced bullfrog, is very similar to the pig frog. However, we have not found any bullfrog in the area where the pig frog is present. These species can be distinguished by differences in the toe webbing of the hind leg. Pig frogs have the longest toe (i.e., fourth toe) of the hind leg entirely webbed to the tip, while in the bullfrog the web does not reach the end of the toe.

R. grylio larvae.

Dorsal view

Lateral view

Distribution – The species is frequently found in canals and flooded areas in the North Tract. It has not been observed in the mangrove forest or pastures.



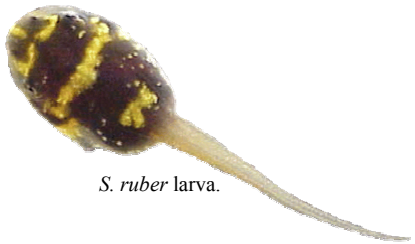
Scinax ruber

Natural History and Ecology – This species is native to Central and South America and was first collected in Puerto Rico in 1988. Since then, it has been collected from several locations along the northeastern coast, between Carolina and Dorado. Its call consists of a series of damped short notes "aaah-aaah-aaah". *Scinax ruber* is a tree frog, much like a coquí, but it reproduces in water. Like *Leptodactylus albilabris*, *Bufo marinus*, and *Rana grylio*, *Scinax ruber* also passes through a tadpole stage. Tadpoles have been found in many aquatic sites including shallow grassy depressions along roads, herbaceous wetlands, and in the *Pterocarpus officinalis* forest when it is flooded. The species is most common in wetlands where *Typha* sp. (cattail) dominates, probably due to the high vertical and dense structure these plants provide. The frogs are very wary, leaping from low vegetation deep into denser vegetation and to the ground to avoid being captured. In the herbaceous wetlands, this species reach a density of more than 1,011 individuals per acre (2,500 per hectare), which is the highest density reported so far from any introduced frog in Puerto Rico.

Male.

Female.

Size and Coloration – Adults grow to 1.7” (4.4 cm) in snout-vent length. Adult males are yellowish brown with two dorso-lateral brown bands, and a brown band, which starts behind each eye and runs to the mid flank. The hind legs have a pinkish coloration. Adult females are creamy brown, with no yellow coloration, but with the same pattern design as in males. Tadpoles grow to approximately 0.5” (1.3 cm) from snout to tail tip. The body is dark brown to almost black with a series of golden yellow dorsal marks.

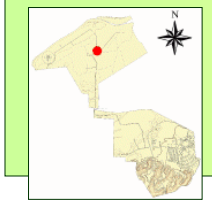


S. ruber larva.

Similar species –
There are no similar species. In addition, the larvae of *Scinax ruber* are very distinct and should not be confused with larvae of any introduced or native species.

Distribution – The species is found in herbaceous wetlands and flooded pastures in the North Tract. Animals remain relatively inactive on dry nights and come out in great numbers after it rains. They can be seen hopping over the vegetation, on roads, shrubs, and trees along roads. Tadpoles have been frequently found in pools in herbaceous wetlands and within the *Pterocarpus officinalis* forest, but they have not been observed in the mangrove forest. Although tadpoles are common in the *P. officinalis* forest, no adults have been observed in this habitat. This suggests that tadpoles drift in with the water current, but tadpoles do not live long enough to complete metamorphosis in the brackish water.

Individuals can be found at high densities.



Trachemys s. stejnegeri

Natural History and Ecology – This is the only native fresh water turtle, or slider, from Puerto Rico. It is locally known as ‘jicotea’ or ‘hicotea’. The jicotea occurs in creeks, streams, and artificial ponds in lowland areas throughout Puerto Rico. Individuals have also been found at the river mouths and associated sandy beaches along the coast. The jicotea reproduces from April to July. Females build their nests by digging in sand or loose soil near bodies of freshwater. Its diet includes vegetable matter, fruits, shrimps, aquatic snails, fishes, and frog tadpoles.

Size and Coloration – Females are two to three times larger than males. Adult males usually grow to 10.0” (25.4 cm) in carapace length, and females can grow to more than 19.5” (50.0 cm) in carapace length. Males also can be differentiated from females by the male's longer foreleg nails, longer tail, and flatter carapace. In general, the carapace is olive brown or dark colored and all individuals have a dull brownish-red band, which runs from behind each eye to the posterior end of the lower jaws.

Similar species – Several turtles have been introduced to Puerto Rico as part of the pet-trade business. These species include: red-eared slider (*Trachemys scripta elegans*), hieroglyphic river cooter (*Pseudemys concinna hieroglyphica*), map turtles (*Graptemys* sp.), painted turtle (*Chrysemys* sp.), and snapping turtles (e.g., *Chelydra* sp., *Macroclemys* sp.). Pet owners often release these species, and some have established. For example, adults and juveniles of *T. scripta elegans* have been found in small creeks within the San Juan metropolitan area. Although this species also has a red band behind the eye, the band is more conspicuous, brighter, and orange-red rather than dark red as in *T. s. stejnegeri*.

Pseudemys concinna hieroglyphica

Trachemys scripta elegans

Trachemys s. stejnegeri

Distribution – The jicotea has been observed in shallow pools near the road within the herbaceous wetland dominated by the cattail (*Typha* sp.) in the North Tract. Individuals also have been observed in the Rio Cocal while basking on top of drifting logs.

Photo credits – All photos of habitats and animals were taken by Neftalí Rios-López on site at the U. S. Naval Security Group Activity Sabana Seca with the exception of: 1) *Ameiva exsul*, page 13; 2) male *Anolis evermanni*, page 19; 3) *Hemidactylus brooki haitianus*, pages 26-27; 4) juvenile of *Iguana iguana*, page 29; 5) *Typhlops platycephalus*, page 36; 7) embryo of *Eleutherodactylus coqui*, page 38; 8) *Eleutherodactylus antillensis* (male calling), page 42; 9) adult female of *Leptodactylus albilabris*, page 44; 10) larvae of *Bufo marinus*, page 47; 11) fresh water turtles, pages 52-53. These photos were taken in the Botanical Garden in Río Piedras, San Juan, Puerto Rico.

Recommended readings – The following references are recommended for additional information on the natural history of the Puerto Rican amphibians and reptiles. These references include information on morphology, reproductive biology, population ecology, and conservation.

Joglar, R. L. 1998. Los coquíes de Puerto Rico: su historia natural y conservación. Editorial de la Universidad de Puerto Rico, San Juan, Puerto Rico. 232 pages (in Spanish).

Rivero, J. A. 1998. The amphibians and reptiles of Puerto Rico. Second edition, revised. Editorial Universitaria, San Juan, Puerto Rico. 510 pages (in English and Spanish).

_____ & Seguí-Crespo. 1992. Anfibios y reptiles en nuestro folklore. Imprenta San Rafael, Quebradillas, Puerto Rico. 98 pages (in Spanish).